Saskatchewan
Agriculture
and Food

FINAL REPORT

BEEF DEVELOPMENT FUND

19980354

DEVELOPMENT OF RATIONS FOR RED VEAL PRODUCTION WITH HOLSTEIN BULL CALVES

Funded by
The Beef Development Fund

February 2002
Prepared by: University of Saskatchewan

102-06384/

Saskatchewan Beef Development Fund

Project 98000354

RES B035

Development of Rations for Red Veal Production with Holstein Bull Calves

Final Report

December 2001

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Final Report

A. Abstract

The objective of this project was to develop and evaluate cereal grain based rations for the production of red veal. The project was based on earlier work in Quebec on the use of whole corn plus a dairy supplement fed to weaned bull calves from weaning at two or three months of age up to market at 650 lbs. Corn, barley, and wheat were evaluated in this project in a series of trials. In our initial feeding trials the performance was not equal to that in the Quebec trial where a rate of gain of 1.6 kg per day was achieved with a feed conversion of about 2.7:1. However, when hulless barley was supplemented with lysine and methionine rates of gain of 1.6 kg per day were achieved with a feed conversion of approximately 3.5:1. This project is of interest because it demonstrates that Holstein bull calves can achieve very high rates of gain with feed conversions much better than those found under normal feedlot conditions. The market opportunities, however, may be limited because the only processing plant in western Canada is operating at capacity. No further research on this subject is recommended at present, however, the opportunity provided by this technology should not be lost.

B. Executive Summary

The objective of this project was to develop and evaluate cereal grain based rations for the production of red veal from Holstein bull calves. This system of red veal production has been used in Quebec and parts of Ontario with some research at Laval University. In Quebec and Ontario whole corn grain and a commercial dairy supplement is fed to bull calves from weaning through marketing at about 650 lbs.

In our first feeding trial the bull calves averaged 1.41 kg of gain per day on the corn ration compared to 1.32 on the barley ration. The feed conversion ratio was also superior for the corn (2.8:1). The rates of gain on both the corn and the barley rations were inferior to the 1.6 kg per day obtained using corn in the Quebec trial. Using the CPM Dairy Model it was observed that amino acid intake may have been limiting performance in our corn and barley rations. In a second series of feeding trials commercial barley, Lacombe barley, hulless barley, and durum wheat were compared. For each cereal grain an appropriate level of amino acid supplementation was calculated based on the lysine and methionine analyses of these feeds. The best performance (1.6 kg daily gain) was obtained with one of the hulless barley groups supplemented with methionine and lysine. The feed conversion was 3.45:1 which is still inferior to the best rates of conversion obtained with corn in Quebec. Carcass characteristics were completely satisfactory with most of the animals grading A2 and an average color score of 45. This is a desirable color rating and slightly superior to that recorded in most corn feeding trials. Marketing of the animals in this trial was a difficult process in that they were shipped to a producer at Outlook who then transported them to the Innisfail, Alberta plant for slaughter and grading. Development of a red veal industry in Saskatchewan is limited by access to a slaughter plant. The Innisfail plant is operating at capacity and although there may be opportunity for production of red veal and a substantial market in the western United States, processing is a limiting factor. It should be noted that the health of these bull calves fed all grain rations was excellent. Less than 10% of the livers were abscessed and a few if any health problems were encountered. Several poor doing bulls were in some of the groups, but it would appear that these were genetically inferior in their growth potential compared to other animals. The bulls were fed in groups of three with very good shelter and with some bedding. It is known from previous work that even small amounts of

straw consumed may reduce the efficiency of feed use. This may have explained why the feed conversions were slightly lower than those found in Quebec.

C. Technical Report

The objective of this project was to design and evaluate cereal grain based rations for production of red veal. Holstein bull calves are used in Quebec and parts of Ontario for production of red veal. The feeding system used in those provinces is based on whole corn grain and commercial dairy supplement. The only processing plant in western Canada for red veal is located in Innisfail, AB. That plant is operating at near capacity and there is little opportunity for the red veal industry to develop in western Canada without further processing capacity. One of the industry feed suppliers (Grober Inc.) has estimated that all of the Holstein bull calves in western Canada could be marketed as red veal into the western United Sates, primarily the California market. Red veal calves are marketed at 600 to 650 lbs. live weight. They are raised to weaning at several months of age on milk replacer and starter ration in the same manner as replacement dairy heifers. After weaning they are fed an all concentrate ration. In Quebec daily rates of gain of 1.6 kg can be obtained with a feed conversion of 3 kg of feed per kg of gain.

The results of a series of feeding trials at the University of Saskatchewan have been reported in the previous four project reports. Additional information is included in this final report on rations supplemented with amino acids. Based on computer modeling activities it was concluded that amino acid supplementation was likely to improve performance.

Progress Report #1 contained an outline of the proposed feeding trial. Progress Report #2 (February 2000) contained a comparison of corn and barley fed veal calves. The corn used was supplied by a Saskatoon feed company while the barley was a semi dwarf six row feed variety. These rations were formulated to contain approximately 16.5% crude protein. The corn ration slightly outperformed the barley with an average daily gain of 1.41 kg compared to 1.32 kg for the barley. The feed gain ratio for corn was 2.8:1 and barley 3.7:1. The carcass weights for both groups averaged 145 kg with the barley carcass yield being 56.6 and the corn 55.5. Grades for the barley fed steers were slightly higher than those for the corn. From this trial it was concluded that whole unprocessed corn or barley can be successfully utilized in red veal diets. The relative costs of corn and barley would determine which grain to use. It was also noted that the performance on both rations was slightly poorer than obtained in a research trial conducted at Laval University. In the Laval trial corn grain was used with several different protein supplements and daily gains of 1.6 kg per achieved.

Progress Report #3 contained some additional modeling information which indicated that lysine and methionine were both marginal in CPM Dairy Model rations designed to produce 1.5 kg of gain daily. That report also contained partial information on some of the calves used in a study on the effect of supplementary lysine and methionine on feed efficiency and carcass characteristics. Progress Report #4 contained additional modeling information using the just released US-NRC Dairy Model. This model is not designed for use with growing animals at high rates of gain and the results of the use of this model were inconclusive.

The amino acid trial has now been completed and the results summarized. Table 1, which was included in an earlier report, contains the protein, ADF, and NDF composition of the cereal grains and protein supplements. The Lacombe barley contained the highest level of methionine and lysine as a percent of the grain (Table 2). The ingredient composition of the rations are included in Table 3.

Commercial barley with and without amino acids was compared to hulless barley with amino acids, Lacombe barley with amino acids, and durum wheat with added amino acids. Table 4 contains updated data from that reported previously. The difference is that all calves have now completed the feeding trial and feed analysis has been completed. The best rates of gain were obtained with calves fed hulless barley and amino acid supplements with the groups averaging close to 1.6 kg daily. Feed conversion was in the order of 3.5 kg of feed per kg of gain. Commercial barley supplemented with amino acids gave a slightly improved feed conversion with an average daily gain of 1.53 kg per day. Lacombe barley supplemented with amino acids gave the lowest rate of gain and poorest feed conversion. Rates of gain on durum wheat supplemented with amino acids were slightly lower than that for hulless barley. Average dressed weight ranged between 1.43 and 1.54 kg with carcass yields of 51.6 to 54.5%. Average color was good on all animals and most animals graded A2. The price received therefore was not greatly affected by the feeding program, but were influenced by market prices at the Innisfail plant. These prices ranged from $393 to $446 per kg of carcass. The average revenue per calf was $604. It is concluded from this work that average daily gain can be improved through amino acid supplementation, however, the effect on feed conversion is minimal. The feasibility of a red veal industry in Saskatchewan depends on expanded slaughter plant capacity together with the profitability of more traditional beef finishing systems. It does appear, however, that there is a ready market for red veal.

D. Personnel

Name	Time
Amanda Kroeker	5%
Marlene Fehr	27%
Cerah Richardson	50%

E. Equipment

No equipment was purchased for $500 or more.

F. Project Development Materials

Information on the results of these trials will be available to beef and dairy producers in Saskatchewan.

G. Project Photos

Project photos were included in an earlier report.

H. Acknowledgement

Information on this project has been made available to visitors to the University Farm and results will be included in undergraduate and graduate teaching material and will be distributed as widely as possible with recognition to the Saskatchewan Agriculture Development Fund and extension talks and written material.

Evaluation of Methionine and Lysine Supplementation of Unprocessed Barley and Durum Wheat Grains in Veal Calf Diets

Experimental Plan

Twenty-one male calves from the University of Saskatchewan dairy herd were raised to weaning following management procedures similar to those used for replacement heifer calves. Whole milk was fed at ten percent of bodyweight daily (divided into two feedings) to six weeks of age and then at a declining rate to weaning at an average age of 49 days. Preweaned calves were housed in individual straw-bedded floor pens with access to free choice water and starter pellets.

Calves were put into groups of three at weaning such that calves within a group were as similar in age as possible. Groups were assigned to treatments and were fed for an average of 148 days after weaning. Therefore, the average age of calves at sale was 197 days (6.5 months).

Experimental groups were housed in straw-bedded pens inside the calf barn. Straw bedding was added as required to keep the calves dry. Calves did consume some of the straw bedding.

Treatments: 1) Commercial barley fed as 75% of the diet with 25% supplement pellets. No additional methionine or lysine. One group of calves.
2) Commercial barley fed as 60% of the diet with 40% supplement pellets with additional methionine and lysine. One group of calves.
3) Lacombe barley (U of S farm 1999) fed as 60% of the diet with 40% supplement pellets with additional methionine and lysine. One group.
4) Durum wheat fed as 55% of the diet with 45% supplement pellets with additional methionine and lysine. Two groups.
5) Hulless barley fed as 60% of the diet with 40% supplement pellets with additional methionine and lysine. Two groups.

(Grains were fed whole with no processing procedures applied).

Calves were gradually introduced to whole grain rations over a 7 to 10 day adjustment period which included the final 4 to 5 days preweaning. Grains and supplements were mixed with starter in increasing amounts. Calves were fed twice daily to appetite plus 3 to 5% orts. Orts were removed from mangers before each morning feeding, weighed and discarded. Diets were fed in flat bottom wooden mangers located outside the pens. Calves reached through vertical metal bars to eat. City of Saskatoon water was available free choice through one plastic paddle type water bowl per pen.

Calves were raised as intact males and were not dehorned. Calves were weighed at three week intervals and more frequently as they approached market weight.

Calves were sold to Canada West Foods (Alberta) Corporation. Canada West requested that calves reach them at live weights of 620 t0 650 pounds (280 to 295 kg). Calves left the University farm on Saturday afternoons for transport to Salt Creek Cattle Farm near Outlook, Sask., where they were unloaded, fed and watered. Calves were reloaded with Salt Creek calves on Sunday mornings for transport to Innisfail, Alberta, for Monday slaughter.

Canada West listed 111% of the Quebec weekly auction prices as the A2 base price but paid the A2 floor price of $1.80 per pound ($3.97 per kg) on hot dressed weight when the base price was less than $1.80. The floor price was received for most of the experimental calves except for some of the last calves sold (August and October 2000) when the base price exceeded $2.00 per pound. There was a 10 cent per pound discount on "light" calves – the discount was applied to calves with a hot dressed weight less than 310 pounds (140.5 kg). Two of the experimental calves, one Lacombe barley treatment and one durum wheat treatment, dressed light at 308.2 and 307.8 pounds, respectively.

Points of Interest:

- difficulty in obtaining optimum dressed weights with distance to market, double loading and unloading, degree of calf agitation at the first stop, variation in shrink, juggling sale date to suit Salt Creek loads, minimum 2 weeks advance notice to Innisfail plant.
- Lacombe barley calf #337 – slow grower – on feed for 212 days vs 147 and 155 days for pen mates. Sold later in year when price per pound was higher so received significantly more for 337 than for other Lacombe calves.
- Health problems: Calf #340 (hulless barley) was treated for pneumonia at 3 days of age with Nuflor for 2 days. Calf #352 (also hulless barley) was treated for pneumonia at 6 months of age with Excenel for 3 days.
- Calf # 352 (hulless barley) did not like to eat supplement pellets after the other 2 calves were sold (probably never did?). This calf was on feed for longer than other calves in his group but was the only calf out of 21 to grade A1.
- Lacombe barley harvested "tough" – periodically some moldy odor but no visible mold – barley dried over time and movement but may have affected intake.

Feed Costs:

- Hulless Barley was purchased from Dale Reid of Davidson for $92.50/tonne (9.25 cents per kg).
- Durum wheat was purchased from Irvine Heuchert of Saskatoon for $6.00 per bushel (22 cents per kg).
- Commercial barley referred to as "Aberdeen" barley was obtained from U of S feedmill inventory – value as of November/99 not recorded.
- Lacombe barley was University farm grown in 1999 – 49 pounds per bushel, value not recorded.

Project Support:

- Rod Willems and Gord Ostifie at Salt Creek Cattle Farm
- Jeff Eide (Brand Inspector supervisor) and Marilyn (brand inspector)
- Bob Petty (buyer) Canada West Foods, Innisfail
- Saskatchewan Agricultural Development Fund
- University of Saskatchewan farm budget

Table 1. Composition[1] of feeds, dry matter basis

	Dry Matter %	Protein %	ADF %	NDF %
Commercial Barley	88.0	11.6		
Supplement (-AA)	91.8	32.6		
Supplement (+AA)	90.3	38.6	7.6	13.1
Lacombe Barley	88.7	13.5	8.4	37.0
Supplement (+AA)	92.6	39.0	6.6	13.7
Hulless Barley	91.0	12.2	1.1	27.5
Supplement (+AA)	90.3	38.6	7.6	13.1
Durum Wheat	86.1	16.3	2.6	21.8
Supplement (+AA)	92.0	39.1	8.8	14.9

[1] Composite samples analyzed by the Animal and Poultry Science Laboratory, Saskatoon, SK.

Table 2. Feed Grain Methionine and Lysine Content[1], % as fed

	Methionine	Lysine
Commercial Barley	0.182	0.37
Lacombe Barley	0.26	0.388
Hulless Barley	0.193	0.365
Durum Wheat	0.196	0.341

[1] Analyzed by Department of Animal Science, University of Manitoba, Winnipeg.

Table 3. Composition of supplement pellets[1]

Ingredient	Comm Barley No AA	Comm Barley Hulless Barley + AA	Lacombe Barley +AA	Durum Wheat +AA
Barley[2]	14.0	3.6	1.1	-
Durum Wheat[2]	-	-	-	3.6
Corn Gluten Meal	26.0	4.3	4.3	18.3
Soybean meal	20.0	51.7	54.2	24.0
Canola meal	10.0	21.5	21.5	37.0
Commercial premix[3]	12.0	7.5	7.5	6.7
Molasses	5.0	3.2	3.2	2.9
Canola oil	5.0	3.0	3.0	2.7
Sodium bicarbonate	3.2	2.0	2.0	1.8
Cobalt-iodized salt	2.0	1.2	1.2	1.1
Limestone	1.6	0.5	0.5	0.4
Dynamate[4]	0.8	0.5	0.5	0.4
Rumensin Supp[5]	0.4			
Rumensin/AA supp[5]		1.0[6]	1.0[7]	1.1[8]
% of total ration[9]	25	40	40	45

1 0.48 cm pellets (3/16")

2 Grains in the supplement pellets were ground (0.48 cm screen)

3 Formulated to provide 45 mg manganese, 63 mg zinc, 16 mg copper, 0.36 mg selenium, 9,900 IU Vitamin A, 1,800 IU Vitamin D3 and 30 Iu Vitamin E per kg of total ration fed (supplement pellets plus whole grains). The commercial premix also contributes 0.48% calcium, 0.26% phosphorus, 0.19% sodium, 0.32% chloride and 0.14% magnesium to the total ration. Calculated Fe contribution of 92 mg per kg of total ration. Prepared by Masterfeeds, Saskatoon, SK.

4 Contains 22% sulphur, 18% potassium, 11% magnesium (International minerals and Chemical Corp., Mundelein, ILL).

5 To provide 20 mg of monensin activity per kg of total ration for the first 908 kg fed and subsequently to provide 33 mg of monensin activity per kg of total ration.

6 To provide 0.08% DL- Methionine and 0.24% L-Lysine monohydrochloride to the total ration on an as fed basis.

7 To provide 0.03% DL-Methionine and 0.16% L-Lysine monohydrochoride to the total ration on an as fed basis.

8 To provide 0.08% DL-Methionine and 0.31% L-Lysine monohydochloride to the total ration on an as fed basis.

6,7,8 DL-Methioninine, feed grade 99% (Degussa Corporation, Ridgefield Park, NJ).

6,7,8 L-Lysine monohydrochloride 98.5% (Licensed by Ajinomoto Co. Inc., Japan. Manufactured by Heartland Lysine Inc., Eddyville, Iowa).

9 The remainder of each ration consisted of whole unprocessed grain.

Table 4. Effect of diet on growth performance of veal calves fed whole grains

	Commercial		Lacombe	Durum		Hulless	
	Barley	Barley +AA	Barley +AA	Wheat I +AA	Wheat II +AA	Barley I +AA	Barley II +AA
Av. weaning wt, kg	76.5	69.7	70.2	79.2	73.1	78.5	76.2
Av. days on feed, postweaning	154	150	171	145	144	130	143
Av. Live wt at sale[1], kg	294.6	299.7	290.6	292.7	283.6	288.4	297.7
Av. gain per calf, kg	218.1	230.0	220.4	213.5	210.5	209.9	221.5
Average daily gain, kg	1.42	1.53	1.29	1.48	1.47	1.61	1.55
Total DM intake[2], kg/calf							
Grain	569	451	516	431	431	438	488
Supplement	198	302	361	375	376	288	308
Total	767	753	877	806	807	726	796
Av. daily DM intake, kg/calf	4.99	5.02	5.12	5.57	5.60	5.57	5.55
Average feed conversion kg feed DM/kg gain	3.51	3.27	3.89	3.77	3.81	3.45	3.58

[1] Live weight at Saskatoon prior to transport to Innisfail
[2] Actual amount consumed (does not include orts)

Table 5. Effect of diet on carcass characteristics of veal calves fed whole grains

	Commercial		Lacombe	Durum		Hulless	
	Barley	Barley +AA	Barley +AA	Wheat I +AA	Wheat II +AA	Barley I +AA	Barley II +AA
Average live wt @ Innisfail, kg	287.0	288.8	276.7	283.4	270.3	273.5	282.6
Average % shrink[1]	2.6	3.6	4.8	3.2	4.7	5.2	5.1
Average dressed weight, kg	152.3	152.3	142.9	151.4	146.1	147.3	154.0
Average Carcass yield[2], %	53.1	52.7	51.6	53.4	54.1	53.8	54.5
Average color	45.3	43.0	44.3	46.3	46.7	45.3	45.7
Grades	A_2	A_2	A_2	A_2	A_2	A_2	A_2, A_2, A_1

[1] (Saskatoon live weight – Innisfail live weight) ÷ Saskatoon live weight x 100
[2] Live weight and hot dressed weight @ Innisfail.